DOCUMENT RESUME

ED 203 683 FL 012 362

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TITLE The Relationship of Analytical and Holistic Cognitive Styles to Second Language Instructional Methods.
PUB DATE 81
NOTE 18p.; Paper presented at the Annual Meeting of the American Education Research Association (Los Angeles, CA, April 16, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; *Cognitive Style; Individual Differences; Language Research; *Learning Modalities; Multiple Regression Analysis; Psycholinguistics; *Second Language Instruction; *Teaching Methods

ABSTRACT

A study was conducted to determine if students who depend on an analytical cognitive style will learn more when matched with a step-by-step treatment, and whether students who depend on a holistic cognitive style will learn more when matched with an all-at-once treatment. To test these hypotheses, scores on the Wechsler Verbal Similarities Test and the Street Figure Completion Test, as well as an appositional/propositional ratio (where the Street score served as numerator and the Wechsler score served as denominator), were used as aptitude measures for 200 students. A stepwise multiple regression analysis showed that all aptitudes and both treatments were significant predictors of grammar learning outcome; however, an aptitude-treatment-interaction was not found. These results demonstrate the importance of the analytical cognitive style aptitude in predicting grammar learning outcome, and that the analytical, step-by-step second language treatment is superior to the holistic, all-at-once second language treatment in producing higher comprehension posttest scores. (Auther/AMH)

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ED203683

The Relationship of Analytical and Holistic Cognitive Styles to Second Language Instructional Methods

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Presented at Session 36.27, "Cognitive Style, Instruction and Achievement", Annual Meeting of the American Education Research Associates, Los Angeles, April 16, 1981.

FL012362

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THE RELATIONSHIP OF ANALYTICAL AND HOLISTIC COGNITIVE STYLES TO SECOND LANGUAGE INSTRUCTIONAL METHODS

A paper presented to the 1981 AERA Annual Meeting. Los Angeles. April 13-17, 1981.

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The purpose of this research is to show that individuals studying English as a second language (L2) tend to have a preferred analytical or holistic cognitive style, and when this preferred style is matched with either a step-by-step (SBS) analytical treatment or an all-at-once (AAO) holistic treatment, both with generative components, more learning and acquisition of English grammar will be produced than with a mismatch. The generative component is added in support of the assumption that all learning is facilitated by having learners generate examples from their own experience whether their learning style is analytical or holistic (Wittrock, 1974, 1975).

In learning and instruction, an important line of educational research is Aptitude-Treatment-Interaction (ATI) (Cronbach and Snow, 1977) which is the matching of specific learner characteristics to specific treatments to facilitate learning. This cognitive model implies the importance of understanding how an individual's unique cognitive and affective processes relate to selecting instruction (Wittrock, 1978). Educators in the United States have only recently begun to develop lessons geared to individual differences in learners, not solely for middle-class White learners, but also for minority learners, for handicapped learners, and for foreign-born learners.

Cognitive style is an example of an important learner characteristic. Mental ability may be equal among individuals who have different cognitive styles or problem-solving mechanisms; however, if information is continuously presented in an alien manner, this information may not be encoded or stored effectively by the individual, and the individual's mental ability may be consistently seen as deficient, and learning may not always take place (Gazzaniga, 1975).

Recent brain research (Bogen, 1969a b) provides evidence that the left cerebral hemisphere is specialized for logical, analytical, linear information-processing, and the right cerebral hemisphere is specialized for synthetic, holistic, imagistic information-processing. This evidence seems to parallel research on dual cognitive style models, such as, field-independent/field-dependent (Witkin, 1977), verbal/imaginal (Paivio, 1974), analytical/relational (Kagan, Moss, and Sigel, 1963), analytic/relational (Cohen. 1969), serialist/holist (Pask and Scott, 1972), and sequential-successive/parallel-simultaneous (Das, 1975). Methods, such as, dichotic listening, EEG, and psychological tests, identify individuals who depend on analytical, left-brain thought-processing or holistic, right-brain thought-processing.

L2 treatments also tend to fall into analytical and holistic categories. For example, the grammar-translation approach presents rules followed by examples and exercises in a linear, step-by-step fashion, while the direct approach presents language holistically having students listen and try to speak without rule explanation. Other linearly-organized treatments are: the cognitive-code approach, the audio-lingual approach, the silent way, the spiral approach, situational teaching, the Total Physical Response, and programmed learning, while other

holistically-organized treatments are: community language learning and Suggestopedia. A major focus in second language acquisition (SLA) research, comparing L2 treatments to determine which treatment promotes learning "best" has proven inconclusive (Chastain, 1968; Valette, 1969; Levin and Oskarsson, 1972; von Elek and Oskarsson, 1973). However, different treatments seem to require students to use incompatible, divergent cognitive styles, suggesting that no one method can work best for all students. In addition, the best method for an individual student may be one that matches the individual student's cognitive style.

Using the ATI model, there is support for matching students' cognitive styles with instructional methods to facilitate learning. Zelniker and Jeffrey (1977) investigated how analytic-reflective and impulsive-global children differed in tempo in analyzing visual stimuli in component parts. When figures were matched by details, the analytic-reflective children scored higher; when figures were matched by global characteristics, no significant differences were found. Pask and Scott (1972) found that serialist and holist students matched to zoological taxonomy treatments complementing their cognitive styles, learned more than mismatched students. Further support of the ATI hypothesis that hemisphere preference or cognitive style significantly interacts with method was found by Hartnett (1975). Analytical students in the analytical Bull method of Spanish instruction made higher gains and outperformed holistic students in the Bull method; holistic students in the holistic Barcia method of Spanish instruction made higher gains and outperformed analytical students in the Barcia method.

Besides methods differing from one another based on instructional theory, use of materials, teacher-student interaction, amount of L2 used,

or control and sequencing of L2, methods may differ in the type and amount of elaboration that is learner or instructor-generated. Researchers have demonstrated that learner-generated sentences, illustrations, imagery, notetaking, underlining, and summarizing have facilitated learning and retention. The generative model of learning (Wittrock, 1975) asserts that for learning and retention to occur, the learner must generate associations between new information and past experience. The learner, in this study, is asked to generate meaningful statements correctly using the specific grammar structure being taught in either the analytical step-by-step treatment or the holistic all-at-once treatment.

Krashen (1976, 1977, 1978) attempts to explain how adults understand, speak, read, and write a second language. First, many "learn" in formal environments characterized by feedback, error correction, and rule isolation; while others "acquire" language, as children learning their first language do. L2 data that is learned is consciously applied or "monitored" when time is unlimited. When processing time is limited, only L2 data that has been acquired is used. When an individual speaks correctly and fluently, the speech is based primarily on acquired competence, with learning acting only as an editor or monitor (Krashen and Galloway, 1978). In addition, individual differences exist among monitor users and acquirers with the general characteristics of monitor users seeming to relate to an analytical cognitive style.

In summary, evidence exists from brain hemisphere research, cognitive style research, and L2 research for two basic thought-processing styles. The underlying elements of each mode seem to be an analytical, step-by-step style of processing information and a holistic, all-at-once style of processing information. In addition, individual differences in thought-pro-

cessing styles have been identified using psychological tests. In line with ATI research and central to this study, cognitive style aptitudes have been found to produce successful learning when paired with treatments whose organization complements the unique cognitive style of the learner.

Therefore, the following hypotheses were tested:

Hypothesis 1. Students who depend on an analytical-propositional thought-processing mode learn more when matched with an analytical step-by-step L2 treatment which includes elaboration than do students who depend on a holistic-appositional thought-processing mode.

Hypothesis 2. Students who depend on a holistic-appositional thought-processing mode learn more when matched with a holistic, all-at-once L2 treatment which includes elaboration than do students who depend on an analytical-propositional thought-processing mode.

Hypothesis 3. Students who depend on an analytical-propositional thought-processing mode prefer an analytical, step-by-step treatment; while students who depend on a holistic-appositional thought-processing mode prefer a holistic, all-at-once L2 treatment.

Hypothesis 4. Students who report that they are "monitor-users" prefer an analytical cognitive style; students who report that they are "just acquirers" prefer a holistic cognitive style.

Method

Subjects

The subjects included 200 right-handed ESL students at Santa Monica College. Classes were randonly assigned to either the SBS or AAO treatment. The SBS treatment was given to 100 students (40 male and 60 female); the AAO treatment was given to 100 students (24 male and 76 female).

Materials

Psychological tests. The Wechsler Adult Intellisgence Scale Similarities Subtest (Wechsler, 1955), the Street Figure Completion Test (Street, 1931), and the appositional/propositional (A/P) ratio (where the Street Test raw score serves as numerator and the Wechsler Test raw score serves as denominator) as suggested by Bogen (1972) were used to measure individual differences in aptitude. The Wechsler Test requires highly verbal/analytical, logical abstraction skills which is in line with characteristics of an analytical cognitive style and the left hemisphere's propositional thought-processing mode. The Street Test is as non-verbal as possible. A one word written answer was required to describe partially obliterated images. A small A/P ratio indicates an analytical cognitive style preference and/or dependence; a large A/P ratio indicates a holistic cognitive style preference and/or dependence.

Treatment materials. The objective of the Step-By -Step (SBS) and the All-At-Once (AAO) treatments was that ESL students at the low intermediate, intermediate, and advanced levels of English proficiency would understand and be able to use the correct form of the passive voice in appropriate contexts. The SBS and AAO treatments are parallel, except for their different styles of organization designed for students who rely on either an analytical or holistic cognitive style. Both treatments ask the ESL students to generate their own examples. Both are thorough and provide all the information needed to correctly answer the posttest questions. However, rules explicitly-written in the SBS are illustrated and exemplified in the AAO treatment.

Posttest. A written posttest consisted of items geared toward both analytical and holistic thinkers. This test was constructed to insure

content validity with items ranging from controlled to free expression.

Results

The hypotheses were tested using a stepwise multiple regression analysis which showed that analytical and holistic cognitive styles, and the A/P ratio were all statistically significant predictors of the grammar learning outcome. The best predictor was the Wechsler Test (analytical cognitive style) with a significance at the .001 level, followed by the Street Test (holisitc cognitive style) with a significance at the .01 level, and the A/P ratio with a significance at the .05 level. In addition, the treatment variable produced a significant effect on the comprehension posttest at the .01 level. The SBS treatment produced a higher mean on the posttest than did the AAO treatment. See Table 1 and 2. The stepwise multiple regression analysis showed no significant aptitude-treatment-interactions. This inability to find a significant interaction runs counter to the hypotheses predicting that students will learn more when their analytical or holistic cognitive styles are matched with a step-by-step or an all-at-once treatment. Finally, the predictions concerning treatment preference and grammar use did not prove to be statistically significant.

Discussion

In discussing the results of this study, the following will be considered: a. suggested explanations for the strong aptitude and treatment main effects, b. suggested explanations for the lack of aptitude-treatment-interaction, c. suggested explanations of why the predictions concerning treatment preference and grammar use did not prove to be significant, and d. educational implications.

Results of this study indicated that both analytical and holistic

Table 1

Stepwise Multiple Regression Analyses of the Posttest Data

Source	df	F Ratio for Change
Wechsler	(1, 198)	67.36***
Treatment	(1, 197)	8.45**
Wechsler X Treatment	(1, 196)	.88
Street	(1, 198)	12.70**
Treatment	(1, 197)	6.7**
Street X Treatment	(1, 196)	.30
A/P Ratio	(1, 198)	5.73*
Treatment	(1, 197)	6.88**
A/P Ratio X Treatment	(1, 196)	2.06

***Significant at a = .001.

**Significant at a = .01.

*Significant at a = .05.

Table 2

Means and Standard Deviations of Aptitude Measures and Posttest Scores for Each Treatment

Treatment	n		Analytical[a]	Holistic[b]	A/P Ratio[c]	Posttest[d]
Step-by-Step (SBS)	100	Mean	14.22	13.03	.99	57.21
		SD	(3.88)	(3.34)	(.52)	(25.40)
All-at-Once (AAO)	100	Mean	14.22	12.8	1.01	48.26
		SD	(3.88)	(3.71)	(.98)	(22.55)

[a]Maximum possible score on the Wechsler Test is 24.

[b]Maximum possible score on the Street Test is 24.

[c]Score on appositional/propositional ratio is composed of Street score/Wechsler score.

[d]Maximum possible score on the Posttest is 100.

cognitive styles predict grammar-learning outcome with the Wechsler Test or analytical cognitive style being the strongest predictor. However, individuals with analytical cognitive style preference were successful at both the SBS and the AAO treatments as were individuals with holistic cognitive style preference. It was not the case that the interaction of aptitude and treatment predicted performance on the post-test. The superiority of the analytical cognitive style aptitude in predicting this posttest performance is consistent with research delineating the degree of participation of each cerebral hemisphere in the second language acquisition process for the left hemisphere is grammatically sensitive and connected with the acquisition of language rules (Carroll, 1980). On the other hand, some evidence suggests that the right hemisphere in second language acquisition seems to be involved with discrimination and retention of novel sounds (Schneiderman & Wesche, 1980) and processing of concrete nouns (Zaidel, 1978). Conflicting evidence surrounds a so-called "stage-hypothesis" which predicts that the more proficient a student becomes in second language acquisition, the more left-lateralized or dependent on left-hemisphere thought (Obler, 1980). Aside from these specialized functions, cerebral hemisphere use or cognitive style may depend on: a. the stimulus, e.g. verbal or imagistic, b. the response, e.g. writing or pointing, c. the cognitive style most suitable, and d. the preferred cognitive style (Bogen et al., 1972). These complex findings provide some indications of the predictive capacities of both analytical and holistic cognitive styles in successful grammar learning outcome.

The treatment variable produced a statistically significant primary effect on the posttest. The characteristics of the SBS treatment are:

linear, logical, and verbal, i.e. step-by-step. The characteristics of the AAO treatment are: non-sequential, synthetic, and imagistic, i.e. all-at-once. The SBS and AAO treatments not only were contextualized, but were enhanced by instructions to the students to generate their own images, words, sentences, and stories. Thus, as the generative theory of learning suggests (Wittrock, 1974), the ESL student was asked to relate new information (grammar structure) with stored information in order to make associations and construct her own personal examples. The responsibility to learn in both the SBS and the AAO treatments irrespective of their organization rested with the individual learner.

Reliance on self-report can be a problem for a number of reasons. According to Oller (1979) self-reports are typically unstable, necessary evils which are unavoidable in affective research. First, when the students were asked whether they liked the SBS or AAO treatments or not, their responses may have been affected by wanting to please their instructor. Second, when the students were asked if they thought of grammar and corrected themselves when they wrote or spoke, the students may have used "self-flattery" (Oller & Perkins, 1978) by judging that it is desirable to think of grammar and correct themselves. Third, evidence (Solomon & Kendall, 1976; Stallings & Kaskowitz, 1974) suggests that students do not always favor lessons in which they learn best. Reasons for liking or not liking the SBS or AAO treatment need not have been based on preference for analysis versus preference for synthesis, but on other factors, e.g. the energy needed to generate illustrations or an original sentence.

No significant differences were found between groups on either the lesson preference or grammar-use questions. Perhaps, the predictions associated with the self-report questions would have been found if more

questions had been added. Along with the yes/no choices, some five point forced Likert scale questions or "why or why not" information questions could have been added.

Finally, the ATI paradigm, although hypothesized, was not found in this study. It was found that ESL students do display individual differences in cognitive style. However, in addition to cognitive style, individual differences are found in general mental ability, degree of anxiety, motivation, and prior achievement mong others. These countless interacting variables have been difficult to measure and their interactions may be different in different environments or in different stages of learning. Also, the aptitude scores may have been biased by the ESL students' language proficiency; the AAO treatment may have worked better orally, and the posttest may have been biased in favor of analytical thinkers. Hopefully, alternative research methods can be developed to assist educators in describing, evaluating, and predicting which treatments are best for individual student aptitudes.

In summary, the following are some educational implications of this study. First, students who depend on either an analytical or a holistic cognitive style are present in the ESL classroom. Second, each type of learner can learn a grammar structure irregardless of the organization of the written treatment. Third, students with analytical cognitive styles seem to learn a grammar structure best with higher scores on written tests. Fourth, a step-by-step analytical treatment seems to produce higher scores on written tests. Finally, learning is facilitated when the student relates new information to already-learned information by generating original examples. The generalizability of the results of this study to other student populations, as well as the role of ATIs in learning and instruction, remains to be demonstrated.

REFERENCES

Bogen, J. E. The other side of the brain I: Dysgraphia and dyscopia following cerebral commissurotomy. Bulletin of the Los Angeles Neurological Society, 1969, 34, 73-105.

Bogen, J. E. The other side of the brain II: An appositional mind. Bulletin of the Los Angeles Neurological Society, 1969, 34, 135-162.

Bogen, J. E., Dezure, R., TenHouten, W. D., & Marsh, J. F. The other side of the brain IV: The a/p ratio. Bulletin of the Los Angeles Neurological Society, 1972, 37, 49-61.

Carroll, J. B. Twenty-five years of research on foreign language aptitude. In Diller, K. C. (Ed.) Individual differences and universals in language learning aptitude, Rowley: Newbury House, 1980.

Chastain, K. & Woerdhoff, F. J. A methodological study comparing the audio-lingual habit theory and the cognitive-code learning theory. The Modern Language Journal, 1968, 52, 268-279.

Cohen, R. A. Conceptual styles, culture conflict, and nonverbal tests of intelligence. American Anthropologist, 1969, 828-855.

Cronbach, L. J. & Snow, R. E. Aptitudes and instructional methods: A handbook for research on interactions. New York: Irvington (Halsted Press), 1977.

Das, J. P. Structure of cognitive abilities: Evidence for simultaneous and successive processing. Journal of Educational Psychology, 1975, 65(1), 103-108.

Gazzaniga, M. S. Review of the split brain. UCLA Educator, 1975, 17, 9-12.

Hartnett, D. D. The relation of cognitive style and hemispheric preference to deductive and inductive second language learning. Unpublished master's thesis, University of California, Los Angeles, 1975.

Kagan, J., Moss, H. A., & Sigel, I. E. Psychological significance of styles of conceptualization. In J. C. Wright & J. Kagan (Eds.) Basic cognitive processes in children. Monographs of the Society for Research in Child Development, 1963, 28(2), 73-112.

Krashen, S. Formal and informal linguistic environments in language acquisition and language learning. TESOL Quarterly. 10(2), 1976, 157-168.

Krashen, S. Some issues relating to the monitor model. Paper presented at the 1977 TESOL Conference, Miami.

Krashen, S. Individual variation in the use of the monitor. Second Language Research, New York: Academic Press, Inc., 1978, 175-183.

Krashen, S. & Galloway, L. The neurological correlates of language acquisition: Current research. Paper presented at the Sixth Annual Convention of SPEAQ, Quebec City, 1978.

Oller, J. Research on the measurement of affective variables: Some remaining questions. Paper presented at the colloquium on Second Language Acquisition and Use under Different Circumstances, TESOL Convention, Boston, 1979.

Oller, J. and Perkins, K. Intelligence and language proficiency as sources of variance on self-reported affective variables. Language Learning, 1978, 28, 85-97.

Pask, G. & Scott, B. C. E. Learning strategies and individual competence. International Journal of Man-Machine Studies, 1972, 4, 217-253.

Schneiderman, E. I. & Wesche, M. B. Right hemisphere participation in second language acquisition. Paper presented at the Los Angeles Second Language Research Forum, March, 1980.

Solomon, D. & Kendall, A. J. Individual characteristics and childrens performance in "open" and "traditional" classroom settings. Journal of Educational Psychology, 1976, 68, 613-625.

Stallings, J. A. & Kaskowitz, D. H. Follow through classroom observation evaluation 1972-1973. Menlo Park: Stanford Research Institute, 1974.

Street, R. F. A gestalt completion test--A study of a cross section of intellect. New York: Teachers College, Columbia University Contributions to Education, No. 481, 1931.

Valette, R. M. The Pennsylvania project, its conclusions and its implications. The Modern Language Journal, 1969, 396.

von Elek, T. & Oskarsson, M. A replication study in teaching foreign language grammar to adults, Department of Educational Research, Gothenburg School of Education, 1973.

Wechsler, D. The measurement of adult intelligence. Baltimore: Williams and Wilkins, 1955.

Witkin, H. A., Moore, C. A., Goodenough, D. R. & Cox, P. W. Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 1977, 47, 1-65.

Wittrock, M. C. Learning as a generative process. Educational

Psychologist, 1974, 11, 87-95.

Wittrock, M. C. The generative process of memory. UCLA Educator, 1975, 17, 33-43.

Wittrock, M. C. Education and the cognitive processes of the brain. 77th Yearbook of the N.S.S.E., Part II, Chicago: University of Chicago Press, 1978.

Zaidel, E. Lexical organization in the right hemisphere. In Buser, P. and Raugeul-Buser, A. (Eds.) Cerebral correlates of conscious experiences, Amsterdam: Elsevier, 1978, 177-197.

Zelniker, T. & Jeffrey, W. E. Reflective and impulsive children: Strategies of information processing underlying differences in problem solving. Monographs of the Society for Research in Child Development, 1976, 41(5), 1-52.